IN THE CLAIMS

1. (Currently Amended): A method of reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of gateway nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between nodes of said network, said pipelines comprising one or more channels, said method comprising the steps of:

(1) identifying a first set of virtual pipelines for which traffic exceeds a predetermined threshold;

(2) for each virtual pipeline in said first set, determining pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold; and

(3) for each pipeline in said first set that can be increased in size, increasing its size to said size determined in step (2);

wherein step (2) comprises determining a number of channels M by;

$$B_M(\lambda_i/\mu) = \frac{(\lambda_i/\mu)^M / Mi!}{\sum_{n=0}^{M} (\lambda_i/\mu)^n / n!}$$

wherein

$$\rho(t) = \lambda((t)/\mu(t)$$

or

$$\rho'(t) = \lambda(t) - \rho(t)/\mu(t);$$

and wherein

B_m = number of blocked calls;

λ_i= call arrival rate at virtual pipeline i;

1/μ = average holding time per call;

t = time; and

ρ(t) = non-stationary offered load at time t; and

wherein

$\rho(t) = \lambda((t) / \mu(t)$ is used when call rate through said pipeline has been historically increasing and

$\rho'(t) = \lambda(t) - \rho(t)\mu(t)$ is used when call rate through said pipeline has been historically decreasing.

2. (Original): The method set forth in claim 1 wherein said predetermined threshold is a call blocking ratio and wherein step (2) comprises determining a minimum pipeline size that would reduce the call blocking ratio for said pipeline below said predetermined threshold based on call arrival rate at said virtual pipeline and average holding time per call.

3. (Cancelled).

4. (Cancelled).

5. (Cancelled).

6. (Currently Amended): ~~The method set forth in claim 1 further comprising the steps of~~ A method of reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of gateway nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between nodes of said network, said pipelines comprising one or more channels, said method comprising the steps of:

(1) identifying a first set of virtual pipelines for which traffic exceeds a predetermined threshold;

(2) for each virtual pipeline in said first set, determining pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold;

(3) for each pipeline in said first set that can be increased in size, increasing its

size to said size determined in step (2):

(4) for each pipeline in said first set that cannot be resized in accordance with step (3), determining if a path exists that can accommodate a pipeline of said size determined in step (2); and

(5) for each pipeline in said the first set that cannot be resized and for which a path exists that can accommodate a pipeline of said size determined in step (2), creating a pipeline having said size, and directing all new channels between the corresponding gateway nodes through said newly created pipeline.

7. (Currently Amended): The method set forth in claim 6 further comprising the steps of:

(6) deleting each pipeline in said ~~second~~ first set for which a new pipeline was created in step (5) when no channels are utilizing said pipeline.

8. (Original): The method set forth in claim 7 further comprising the steps of:

(7) for each pipeline in said first set that cannot be resized in step (3) and for which an alternate path is determined in step (4) not to exist, determining if a pipeline can be created that can accommodate a fraction of said channels in said pipeline by which said pipeline exceeds said threshold;

(8) creating a new pipeline of a size corresponding to said fraction of channels determined in step (7) and directing said fraction of new channels from said pipeline to said new pipeline.

9. (Original): The method set forth in claim 7 further comprising the steps of:

(9) identifying a second set of virtual pipelines for which traffic is less than said predetermined threshold; and

(10) for each pipeline in said second set, determining a size of the smallest pipeline that can accommodate the traffic present in that pipeline while satisfying said predetermined threshold.

10. (Original): The method set forth in claim 9 further comprising the steps of:

(11) reducing the size of each of said pipelines in said second set that can be

reduced in size to said size determined in step (10);

(12) for each pipeline that cannot be resized in accordance with step (11), determining if a path exists that can accommodate a pipeline of said size determined in step (10); and

(13) for each pipeline for which a path exists that can accommodate a pipeline of said size determined in step (10), creating a pipeline having said size, and directing all new channels between the corresponding gateway nodes through said pipeline.

11. (Original): The method set forth in claim 10 further comprising the steps of:

(14) deleting each pipeline in said second set for which a new pipeline was created in step (13) when no channels are utilizing said pipeline.

12. (Currently Amended): The method set forth in claim ~~3~~ 6 wherein said network is an asynchronous transfer mode network.

13. (Original): The method set forth in claim 12 wherein said network is used to exchange voice data.

14. (Cancelled).

15. (Currently Amended): The method set forth in claim ~~3~~ 6 wherein said network interconnects a plurality of other networks.

16. (Original): The method set forth in claim 15 wherein said other networks comprises time division multiplexed networks.

17. (Currently Amended): A method of identifying pipeline size reconfiguration parameters in a packet-based network comprising a plurality of gateway nodes having data to be transferred, said network utilizing a concept of virtual pipelines between nodes (gateway) of said network, said pipelines comprising a plurality of channels, said method comprising the steps of:

(1) identifying a first set of virtual pipelines for which traffic exceeds a predetermine

threshold;

(2) for each virtual pipeline in said first set, determining a number of channels that would cause said traffic through said pipeline to not exceed said predetermined threshold;

wherein said predetermined threshold is a call blocking ratio and wherein step (2) comprises determining a minimum pipeline size that would reduce the call blocking ratio for said pipeline below said predetermined threshold based on call arrival rate at said virtual pipeline and average holding time per call;

wherein said minimum pipeline size is expressed as a number of channels, M, in said pipeline and wherein step (2) comprises determining a number of channels M by;

$$B_M(\lambda_i / \mu) = \frac{(\lambda_i / \mu)^M / M!}{\sum_{n=0}^{M} (\lambda_i / \mu)^n / n!}$$

wherein

$$\rho(t) = \lambda((t) / \mu(t)$$

or

$$\rho'(t) = \lambda(t) - \rho(t)\mu(t)$$

B_m = number of blocked calls;

λ_i= call arrival rate at virtual pipeline i;

$1/\mu$ = average holding time per call;

t = time; and

ρ(t) = non-stationary offered load at time t; and

wherein $\rho(t) = \lambda((t) / \mu(t)$ is used when call rate through said pipeline has been historically increasing and $\rho'(t) = \lambda(t) - \rho(t)\mu(t)$ is used when call rate through said pipeline has been historically decreasing.

18. (Cancelled).

19. (Cancelled).

20. (Cancelled).

21. (Currently Amended): The method set forth in claim ~~19~~ 17 further comprising the steps of:

(~~9~~ 3) identifying a second set of virtual pipelines for which traffic is less than said predetermined threshold; and

(~~10~~ 4) for each pipeline in said second set, determining a size of the smallest pipeline that can accommodate the traffic present in that pipeline.

22. (Original): The method set forth in claim 21 further comprising the step of:

(10) calculating a peak cell rate corresponding to said number of channels determined in step (2).

23. (Currently Amended): The method set forth in claim ~~20~~ 17 wherein said network is an asynchronous transfer mode network.

24. (Original): The method set forth in claim 23 wherein said network is used to exchange voice data.

25. (Cancelled).

26. (Currently Amended): The method set forth in claim ~~20~~ 17 wherein said network interconnects a plurality of other networks.

27. (Original): The method set forth in claim 26 wherein said other networks comprises time division multiplexed networks.

28. (Original): The method set forth in claim 27 wherein said other networks comprise public service telephone networks.

29. (Currently Amended): An apparatus for reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between said nodes (gateway), said pipelines comprising one or more channels, said apparatus comprising:

means for identifying a first set of virtual pipelines for which traffic exceeds a predetermined threshold;

means for determining, for each virtual pipeline in said first set, a pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold; ~~and~~

means for increasing, for each pipeline in said first set that can be increased in size, said pipeline's size to said size determined by said means for determining; and

means for determining, for each pipeline in said first set that cannot be resized, if a path exists that can accommodate a pipeline of said determined size; and

means for creating, for each pipeline in said first set that cannot be a resized and for which a path exists that can accommodate a pipeline of said determined size, a virtual pipeline having said size, and directing all new channels between the corresponding nodes (gateways) through said pipeline created in step.

30. (Cancelled).

31. (Original): The apparatus set forth in claim ~~30~~ 29 further comprising:

means for deleting each pipeline in said ~~second~~ first set for which a new pipeline was created when no channels are utilizing said pipeline.

32. (Currently Amended): ~~The apparatus set forth in claim 31 further comprising~~ An apparatus for reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between said nodes (gateway), said pipelines comprising one or more channels, said apparatus comprising:

means for identifying a first set of virtual pipelines for which traffic exceeds a predetermined threshold;

means for determining, for each virtual pipeline in said first set, a pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold;

means for increasing, for each pipeline in said first set that can be increased in size, said pipeline's size to said size determined by said means for determining:

means for deciding, for each pipeline in said first set that cannot be resized and for which an alternate path is determined not to exist, if a pipeline can be created that can accommodate a fraction of said channels in said pipeline by which said pipeline exceeds said threshold; and

means for creating a new pipeline of a size corresponding to said fraction of channels and directing said fraction of new channels from said pipeline to said new pipeline.

33. (Cancelled).

34. (Cancelled).

35. (Previously Presented): ~~The apparatus set forth in claim 34~~ An apparatus for reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between said nodes (gateway), said pipelines comprising one or more channels, said apparatus comprising:

means for identifying a first set of virtual pipelines for which traffic exceeds a predetermined threshold;

means for determining, for each virtual pipeline in said first set, a pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold;

means for increasing, for each pipeline in said first set that can be increased in size, said pipeline's size to said size determined by said means for determining;

wherein said predetermined threshold is a call blocking ratio and wherein said means for determining determines a minimum pipeline size that would reduce the call blocking ratio for said pipeline below said predetermined threshold based on call arrival rate at said virtual pipeline and average holding time per call;

wherein said minimum pipeline size is expressed as a number of channels, M, in said

pipeline and wherein said means for determining determines a number of channels M by;

$$B_M(\lambda_i / \mu) = \frac{(\lambda_i / \mu)^M / Mi!}{\sum_{n=0}^{M} (\lambda_i / \mu)^n / n!}$$

wherein

$$\rho(\tau) = \lambda((\tau) / \mu(\tau)$$

or

$$\rho'(t) = \lambda(t) - \rho(t)] / \mu(t)$$

B_m = number of blocked calls;

λ_i= call arrival rate at virtual pipeline i;

$1/\mu$ = average holding time per call;

t = time; and

ρ(t) = non-stationary offered load at time t; and

wherein $\rho(t) = \lambda((t) / \mu(t)$ is used when call rate through said pipeline has been historically increasing and $\rho'(t) = \lambda(t) - \rho(t)] / \mu(t)$ is used when call rate through said pipeline has been historically decreasing.

36. (Cancelled).

37. (Currently Amended): ~~The apparatus set forth in claim 36 further comprising:~~ An apparatus for reconfiguring pipeline sizes in order to relieve congestion in a packet-based network, said network comprising a plurality of nodes having data to be transferred therebetween, and utilizing a concept of virtual pipelines between said nodes (gateway), said pipelines comprising one or more channels, said apparatus comprising:

means for identifying a first set of virtual pipelines for which traffic exceeds a

predetermined threshold;

means for determining, for each virtual pipeline in said first set, a pipeline size that would cause said traffic through said pipeline to not exceed said predetermined threshold;

means for increasing, for each pipeline in said first set that can be increased in size, said pipeline's size to said size determined by said means for determining;

wherein said predetermined threshold is a call blocking ratio and wherein said means for determining determines a minimum pipeline size that would reduce the call blocking ratio for said pipeline below said predetermined threshold based on call arrival rate at said virtual pipeline and average holding time per call;

wherein said minimum pipeline size is expressed as a number of channels, M, in said pipeline and wherein said means for determining determines a number of channels M by;

$$B_M(\lambda_i / \mu) = \frac{(\lambda_i / \mu)^M / Mi!}{\sum_{n=0}^{M} (\lambda_i / \mu)^n / n!}$$

wherein

$$\rho(\tau) = \lambda((\tau) / \mu(\tau)$$

or

$$\rho'(t) = \lambda(t) - \rho(t)] / \mu(t)$$

B_m = number of blocked calls;

λ_i= call arrival rate at virtual pipeline i;

$1/\mu$ = average holding time per call;

t = time; and

$\rho(t)$ = non-stationary offered load at time t;

means for identifying a second set of virtual pipelines for which traffic is less than said predetermined threshold; and

means for determining, for each pipeline in said second set, a size of the smallest pipeline that can accommodate the traffic present in that pipeline; and

means for reducing the size of each of said pipelines in said second set that can be reduced in size to said smallest size;

means for determining, for each pipeline that cannot be resized, if a path exists that can accommodate a pipeline of said smallest size; and

means for creating, for each pipeline for which a path exists that can accommodate a pipeline of said smallest size, a virtual pipeline having said size, and for directing all new channels between the corresponding nodes through said pipeline.

38. (Original): The apparatus set forth in claim 37 further comprising:

means for deleting each pipeline in said second set for which a new pipeline was created when no channels are utilizing said pipeline.